AUDIENCE MONITORING AND REPORTING SYSTEM

Publication number: WO0016552 (A1)

Publication date: 2000-03-23

Inventor(s): QAYYUM HAMID M; LEHNER STEPHEN W
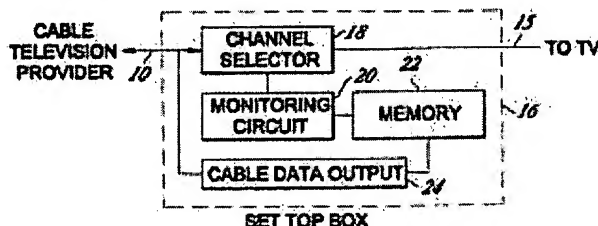
Applicant(s): MILLENNIUM NETWORKS INC [US]

Classification:

- **international:** *H04H60/43; H04N7/16; H04N7/173;* H04H60/37; H04H60/97; H04H1/00; H04N7/16; H04N7/173; (IPC1-7): H04N7/00

- **European:** H04N7/173C2; H04H60/43; H04N7/16E3

Application number: WO1999US21056 19990914

Priority number(s): US19980153125 19980915

Also published as:

EP1142325 (A1)

CA2343989 (A1)

AU1091600 (A)

Cited documents:

US5734720 (A)

US5528582 (A)

US5410344 (A)

Abstract of WO 0016552 (A1)

An apparatus and method are disclosed for monitoring and reporting TV habits of TV viewers. In accordance with the invention, information representative of TV habits is monitored and stored within a TV (12) or set top box (16), controlled from a remote location such as a cable service provider location. Control signals may be communicated to the set top box (16) or TV (12) via RF or electrical connections, such as CATV wire (10). The information may be reported through the remote location by the same or alternate means, such as in an unused portion of the video signal bandwidth or, telephone line (11), or video frequency modem (30).

Data supplied from the *esp@cenet* database — Worldwide

(54) Title: AUDIENCE MONITORING AND REPORTING SYSTEM

(57) Abstract

An apparatus and method are disclosed for monitoring and reporting TV habits of TV viewers. In accordance with the invention, information representative of TV habits is monitored and stored within a TV (12) or set top box (16), controlled from a remote location such as a cable service provider location. Control signals may be communicated to the set top box (16) or TV (12) via RF or electrical connections, such as CATV wire (10). The information may be reported through the remote location by the same or alternate means, such as in an unused portion of the video signal bandwidth or, telephone line (11), or video frequency modem (30).

AUDIENCE MONITORING AND REPORTING SYSTEM

Field of the Invention

The present invention relates generally to methods
for monitoring the television viewing habits of
television viewers and more particularly to a method for
monitoring television viewing habits which comprises
storing information representative of television viewing
habits in either a television or a set top box and
subsequently transmitting the stored information to a
remote location.

Background of the Invention

Monitoring the television viewing habits of
television viewers provides information which is valuable
to cable service providers, television programmers,
advertisers, and the like. Cable service providers and
television programmers use information regarding
television viewing habits to define programming. Thus,
television programs which are widely viewed may be
rescheduled for better viewing times, while television
programs that are less well viewed may be rescheduled for
periods of time when fewer viewers are watching
television, or may be removed.

Advertisers need to know how many people are viewing
different television programs, to determine how their
advertising money is best spent. Of course, an
advertiser will be willing to pay more for advertising
time during a very popular television program, than for
the same amount of time during less well watched
television programs.

As such, it is well accepted that information
relating to the viewing habits of television viewers is
valuable and should be collected. One prior art attempt
to collect such information regarding the viewing habits
of television viewers has been to provide an electronic
device, which typically sits atop a television, to record
which channel is being watched and at what time the

-2-

channel is being watched. Such electronic devices may be
wired either directly into a television set, or may work
in cooperation with a cable service provider set top box.

5   As those skilled in the art will appreciate, the
cable service provider set top box is used to receive a
plurality of channels provided by the cable service
provider to be viewed at any given time. Thus, it is a
comparatively simple matter to provide electrical
communication between the set top box and recording
10   device which records the time and the channel selected by
the set top box.

           However, one deficiency associated with such prior
art recording devices is that it is typically necessary
for a representative of the data collecting entity to
15   actually visit each house wherein such data is being
recorded, so as to download the data collected by the
recording device.

           According to one prior art attempt to mitigate the
problems associated with such manual collection of data,
20   a modem is used to transmit the recorded data via
telephone to the intended recipient.

           According to another prior art attempt to mitigate
the problems associated with such manual data collection,
a radio transmitter is used to transmit the recorded
25   data.

           Another problem associated with the collection of
data regarding the television viewing habits of
television viewers is the requirement for a separate
electronic device for collecting and storing the time and
30   channel data. Not only does the use of such an
additional device require delivery and labor intensive
installation, but it is also frequently considered
undesirable to have another device sitting atop or near
their television.

35   Typically, the television set and/or the surrounding
area will already be cluttered with various electronic
devices such as a VCR, a DVD player, stereo equipment, as

well as many other electronic devices which are frequently used so as to provide entertainment and/or enhance viewing. Thus, the addition of another electronic device, particularly one which does not
5   provide any direct enhancement of television viewing, is frequently undesirable.

In view of the forgoing, it is desirable to provide a method for monitoring the television viewing habits of television viewers which does not require installation of
10 an additional electronic device on or near television viewers television, and which does not require the collection of data recorded thereby by a person visiting the home of the viewer.

15   **Summary of the Invention**

The present invention specifically addresses and alleviates the above-mentioned deficiencies associated with the prior art. More particularly, the present invention comprises a method and apparatus for monitoring
20 television viewing habits of a television viewer. In accordance with the present invention information representative of television viewing habits is stored within either a television or a set top box, such as those provided by cable television service providers for
25 selecting the channel to be viewed. The information representative of the television viewing habits is systematically transmitted to a remote location, such as to a cable service provider, for processing and distribution thereof.
30 As those skilled in the art will appreciate, both contemporary set top boxes and televisions utilize microprocessor control. Such contemporary set top boxes and televisions comprise a memory which stores instructions for the microprocessor. It will further be
35 appreciated that such memories are typically selected so as to have excess capacity in order to facilitate future changes and upgrades in the instruction set.

-4-

According to the preferred embodiment of the present invention, instructions for monitoring viewing habits and for storing the results may be added to the existing instruction set stored within the set top box
5   microprocessor memory, or in memory space within the television.

Those skilled in the art will further appreciate that such memories frequently comprise flash memories, that may be changed or updated easily. According to the
10   preferred embodiment of the present invention, such flash memories are configured such that they may be remotely updated, via an unused portion of the video signal which the cable service provider uses to bring cable service to the television viewer. Alternatively, such flash
15   memories may be changed or upgraded via telephone connection. In this manner, instructions as required to monitor and record television viewing habits may be stored in the flash memory, and updated merely by transmitting instruction set up from the cable service
20   provider. or other remote location.

As those skilled in the art will further appreciate, some cable television service providers provide bi-directional service, wherein bi-directional communication may be utilized by the television viewer for various
25   different transactions, such as buying food or other products, transferring funds, and/or Internet access. Where cable Internet access is provided, instructions necessary to monitor and record television viewing information may be communicated to the desired set top
30   box and/or television via the Internet, from any convenient location.

Further, when such Internet service is provided, the results of television viewer habit monitoring may be similarly downloaded via the Internet to any convenient
35   location. Thus, the results of such television viewer habit monitoring may be transferred to a web page, if desired.

-5-

Information representative of television viewing habits typically comprise code, time, channel, and channel source information. Identification codes identify the particular television viewer whose habits
5   are being monitored. That is, the identification code which is associated with the set top box or television, - for a particular television viewer. Time information is typically indicative of the time at which channel is changed, so as to facilitate generation of a report which
10 shows times at which particular channels are being viewed. The channel information identifies that channel which is being viewed by the television viewer. The channel source code is representative of where the television signal originates from, e.g., broadcast,
15 cable, etc.

   According to one embodiment of the present invention, information representative of television viewing habits may be stored in volatile memory. However, in another embodiment the information may be
20 stored in non-volatile memory. In this manner, the information is maintained in the event of a power outage or if the set top box or television is unplugged.

   According to one preferred embodiment of the present invention, only channel information for channels which
25 are watched for a predetermined length of time is recorded. Thus, when the television viewer is rapidly changing channels, this information is not stored. The information regarding channels being viewed is preferably only stored when the channel has remained constant for a
30 predetermined length of time, e.g., one minute.

   The stored information is preferably transmitted periodically to a remote location. Transmission may be preformed at a predetermined time each day, or after a predetermined interval of time. Thus, for example, the
35 stored information may be transmitted at 2:00 A.M. each day. Alternatively, the information may be transmitted after each 24 hours of television viewing.

-6-

In one embodiment, the stored information is downloaded when the memory in which the stored information resides nears its storage capacity. In this manner, the memory is transmitted and cleaned prior to
5   becoming full, so as to prevent any loss of data due to memory overload. In another embodiment, stored — information is transmitted to the remote location only when requested by a remote host. The remote host may perform a polling procedure so as to request data from a
10   plurality of such memories, sequentially, or in some other ordered manner.

According to the preferred embodiment of the present invention, the stored information is downloaded to a remote location via bi-directional cable television
15   cable. Alternatively, the stored information may be transferred via telephone. A radio modem may be utilized to transmit the stored information to the remote location, such as a centrally located cell site which receives information from a plurality of home radio
20   modems.

Thus, according to the present invention, set top box is provided for facilitating cable television service and for monitoring the television viewing habits of television viewers. The set top box comprises an input
25   port for receiving a plurality of cable television channels; and output port for communicating at least one television channel to television; a non-volatile memory for storing instructions for monitoring of television viewing; a volatile memory for storing information
30   representative of television viewing; and monitoring software configured to monitor which channel is being viewed according to instruction stored in the non-volatile memory and for storing information representative of which channel is being viewed and at
35   which time, in the volatile memory.

A data output circuit of the set top box transmits stored data representative of television viewing habits

-7-

to the remote location via the cable television cable. Of course, this embodiment of the present invention requires that the television cable be configured for bi-directional communications.

5   Alternatively, particularly in the event that the cable television cable is not configured for bi-directional communications, a telephone data output circuit transmits the stored data to the remote location via telephone. In a further option, viewer data may be
10   transmitted to the remote location via a radio, such as a radio modem.

Non-volatile memory preferably comprises a flash memory, such that it may be changed and/or upgraded easily. Such a flash memory may be changed and/or
15   upgraded via the television cable. The volatile memory preferably comprises RAM (Random Access Memory).

According to a second embodiment of the present invention the monitoring and storage of the viewer data is performed within the television, rather than within a
20   set top box. The circuitry and methodology of the second embodiment is similar to that of the first embodiment. Rather than sensing selection of channels at the set top box, the sensing is performed within the television itself. The television comprises an input port for
25   receiving a plurality of television signals (cable and/or analog or digital broadcast). The second embodiment of the present is particularly useful when cable ready televisions are utilized. As those skilled in the art will appreciate, such cable ready televisions do not
30   require a set top box. As in the first embodiment, non-volatile memory is utilized for storing instructions for performing monitoring of television viewing and volatile memory is utilized for storing information representative of television viewing habits. Again, software is used to
35   monitor which channel is being viewed according to the instructions stored in the non-volatile memory and

-8-

volatile memory stores information representative of which channel is being viewed and at what time.

As in the first embodiment of the present invention, stored data representative of television viewing habits
5   is transmitted to the remote location via either a cable television cable, a television data output circuit, or — via radio, e.g., a radio modem.

Thus, according to the present invention, need for a separate, stand alone electronic device, as well as the
10   disadvantages associated therewith, are voided. Viewer monitoring takes place in either the set top box or the television and may be performed merely by loading the instruction set into a memory of the television or the set top box and causing the instructions to execute so as
15   to facilitate such monitoring, storing and down-loading. Instruction sets may be loaded into the television or the set top box via the cable television cable, telephone line, or via a radio modem, if desired.

These, as well as other advantages of the present
20   invention will be more apparent from the following description and the drawings. Note that changes in the specific structure shown and described may be made within the scope of the claims without departing from the spirit of the invention.
25

Brief Description of the Drawings

Figure 1 is a block diagram of a first embodiment of the present invention wherein the television viewing habits are monitored via the set top box, such as those
30   commonly used by cable service providers;

Figure 2 is a block diagram of the set top box of Figure 1, showing use of the cable television cable for transmitting monitoring results to a remote location;

Figure 3 is a block diagram of the set top box of
35   Figure 1, showing use of the telephone line for transmitting monitoring results to a remote location;

Figure 4 is a block diagram of the set top box of

Figure 1, showing use of the radio modem for transmitting monitoring results to a remote location;

Figure 5 is a block diagram of the second embodiment of the present invention wherein monitoring of viewing

5   habits is performed within the television;

Figure 6 is a block diagram of the television of Figure 5, showing use of the cable television cable for transmitting monitoring results to a remote location;

Figure 7 is a block diagram of the television of

10   Figure 5, showing use of the telephone line for transmitting monitoring results to a remote location;

Figure 8 is a block diagram of the television of Figure 5, showing use of the radio modem for transmitting monitoring results to a remote location;

15   Figure 9 is a block diagram illustrating the basic structure of a system for generating, receiving and processing audience viewing information; and,

Figure 10 is an illustration of a redundant system such as that shown at Figure 9.

20   Figure 11 is an illustration of another system level embodiment of the invention wherein control signals, video signals, and audience viewing information is communicated via the direct connection with the cable service provider.

25

Detailed Description of the Preferred Invention

The detailed description set forth below in connection with the appended drawings is intended as a description of presently preferred embodiments of the

30   invention, and is not intended to represent the only forms in which the present invention may be constructed or utilized. The invention sets forth the functions and the sequence of steps for constructing and operating the invention in connection with the illustrated embodiments.

35   It is to be understood, however, that the same or equivalent functions may be accomplished by different

-10-

embodiments that are also intended to be encompassed within the spirit and scope of the invention.

The audience engine of the present invention is illustrated in Figures 1-8 which depict two presently
5   preferred embodiments thereof.

Referring now to Figure 1, according to the first — embodiment of the preferred invention cable 10 from the cable television provider provides a plurality of channels to set top box 16 via an input port 14 thereof.
10   The set top box 16 operates according to well known principles to facilitate the selection by the television viewer, of a desired channel which is then provided via output port 15 though television 12.

According to the first embodiment of the present
15   invention, the monitoring of television viewing habits is performed within the set top box 16 and facilitates such monitoring and communicating back to the cable television provider, or any other desired remote location (remote from the location of the television viewer). The set top
20   box 16 may be implemented as a programmable cable controller, such as the CFT 2200 or DCT series controller marketed by General Instruments. When programmed in accordance with the present invention the monitored results may be communicated to the remote location via
25   various means such as via the cable television cable 10, via a telephone line 11 (Figure 3), and/or via a radio modem 30 (Figure 4), as discussed in detail below. Cable 10 may be implemented as a bidirectional cable such that commands to the set top box may be communicated in a
30   first unused portion of the video signal, and data downloads may proceed in the same or a separate unused portion of the video signal bandwidth. Use of telephone lines or modems may similarly proceed in a bidirectional manner, or may proceed in a single direction with the
35   cable 10 providing the second communication path.

Referring now to Figure 2, the set top box 16 comprises a channel selector 18 which is utilized

according to well known principles to facilitate the
selection of a desired one of the plurality of channels
provided by the cable television cable 10 to the
television 12.

5   According to the present invention a programmable
monitoring circuit 20 is disposed in communication with —
the channel selector 18 such that the monitoring circuit
20 recognizes changes in the channel selected by the
channel selector 18. The monitoring circuit 20 also

10   stores such channel changes into memory 22, along with
the time of such channel changes.

Cable data output 24 transmits data representative
of the viewer monitoring information stored in memory 22
to a desired remote location, via cable television cable

15   10.

Referring now to Figure 3, alternatively, telephone
data output 26 is in communication with memory 22 so as
to facilitate the communication of viewing data to a
desired remote location via telephone line 11. Those

20   skilled in the art will appreciate, some set top boxes
may be manufactured so as to facilitate communication
via telephone, thereby providing a return path for
television viewers who wish to perform transactions for
paying pay-per-view services via the telephone.

25   Referring now to Figure 4, the radio modem output 28
is alternatively in communication with memory 22 so as to
facilitate the communication of viewing habit data to a
desired remote location via radio modem 30.

Referring now to Figure 5, according to a second

30   embodiment of the preferred invention cable 10 from the
cable television provider provides a plurality of
channels to television 12 via an input port 13 thereof.
The television 12 operates according to well known
principles to facilitate the selection by the television

35   viewer, of a desired channel.

According to the second embodiment of the present
invention, the monitoring of television viewing habits is

-12-

performed within the television 12 and facilitates such
monitoring and communicating back to the cable television
provider, or any other desired remote location (remote
from the location of the television viewer). The
5   monitoring results may be communicated to the remote
location via various means such as via the cable
television cable 10, via a telephone line 11 (Figure 7),
and/or via a radio modem 30 (Figure 8), as discussed
above.

10   Referring now to Figure 6, television 12 comprises
a channel selector 19 which is utilized according to well
known principles to facilitate the selection of a desired
one of the plurality of channels provided by the cable
television cable 10 to the television 12.

15   According to the present invention a programmable
monitoring circuit 21 is disposed in communication with
the channel selector 19 such that the monitoring circuit
21 recognizes changes in the channel selected by the
channel selector 19. The monitoring circuit 21 also
20 stores such channel changes into memory 23, along with
the time of such channel changes. The monitoring circuit
may be programmed in accordance with the present
invention, a the time the television is constructed.
Alternatively the television may be constructed to select
25 programmable access to internal microprocessors via
cable, telephone line and/or radio modem. In the
presently preferred embodiment of the invention depicted
at Figures 5-8, programming is located in unused memory
space at the time the television is manufactured.

30   Cable data output 25 transmits data representative
of the viewer monitoring information stored in memory 23
to a desired remote location, via bi-directional cable
television cable 10.

        Referring now to Figure 7, alternatively, telephone
35 data output 27 is in communication with memory 23 so as
to facilitate the communication of viewing data to a
desired remote location via telephone line 11. Those

-13-

skilled in the art will appreciate, some televisions may be manufactured so as to facilitate communication via telephone, thereby providing a return path for television viewers who wish to perform transactions for paying pay-

5   per-view services via the telephone.

Referring now to Figure 8, the radio modem output 29 — is alternatively in communication with memory 23 so as to facilitate the communication of viewing habit data to a desired remote location via radio modem 30.

10   Figure 9 is a block diagram illustrating the basic structure of the system for generating, receiving, and processing the audience viewing information according to the present invention.

Figure 10 is an illustration of a redundant system

15   in conformance with that set forth at Figure 9. It should be understood that the embodiment set forth at Figure 9 and 10 are premised upon a radio modem embodiment of the invention, such as that set forth in connection with Figures 4 and 8. As one of skill in the

20   art will recognize, alternate embodiments of the systems set forth at Figures 9 and 10 that may be similarly implemented to support the embodiments of the invention set forth at Figures 2, 3, 6 and 7.

Referring to Figure 9, a system is shown wherein

25   inbound cable information, e.g., conventional programs and command instructions are communicated to set top box 16, which may be implemented as Model CFT 2200 Cable Box marketed by General Instruments. Resident within the set top box 16 is programming information as described above,

30   and as exemplified in the programming information set forth below. The set top box 16 functions to send data that reported viewing information data to the in-home radio modem 30, which may function to receive and transmit data by radio frequency protocol. The base

35   station server 31 may be implemented as a personal computer running software, such as that Sockeye set forth in our co-pending application Serial Number 09/069,609

-14-

for data communication system, assigned to the common
assignee. Base station server 31 functions to collect
data from the in-home modem 30 and to communicate that
data to a primary application server 33. The primary
5   application server 33 may also be implemented as a
personal computer that functions to collect data from a –
plurality of base station servers 31, and compile that
data. The primary application server 33 may be
implemented as a web server to allow users to view the
10   data compiled by the primary application server 33.

      Figure 10 illustrates a plurality of systems, such
as that disclosed at Figure 9, coordinated to common
primary application server 33, via a plurality of base
station servers 31, interconnected to a public network
15   35, which may be implemented at the internet.

      Figure 11 illustrates another system level
embodiment of the invention, wherein signals to and from
the set top box 16 or implemented through cable 10,
rather than partially through radio modem 30 as
20   illustrated at Figure 10. As such, the system level
instrumentation of Figure 11 corresponds more to a system
level implementation of the construction set forth at
Figures 2 and 6.

      According to Figure 11, signals to and from the set
25   top box 16 are implemented by cable links 10a and 10b,
which may be implemented as a single cable, but are shown
as separate for purposes of distinguishing upstream and
downstream signals. The downstream signals communicated
on cable 10a include control signals as well as
30   scrambled, modulated video signals. The upstream
signals, communicated on cable 10b, include viewer
generated viewing information, collected in accordance
with the present invention. Cables 10a and 10b are
communicated to head end 37, typically a facility
35   operated by the cable television provider. Signals from
the head end 37 are communicated to head end server 31
via eithernet connection 39 and controller 32.

-15-

As will be apparent to one of ordinary skill in the art, the implementation shown at Figure 10 and 11 are representative of various constructions that may be implemented within the broader aspects of the invention.

5   In each case the implementation permits remote control over the operation of the audience monitoring device, and _ downloading of audience viewing data without the need to physically be present at the audience viewing location. Accordingly various enhancements and modifications of the

10   invention may be implemented without departing from the broader aspects of the invention.

Set forth below is an instruction set, known as the audience engine, for implementing the present invention. The Audience Engine is an application that runs within a

15   set-top cable converter, or a television e.g., General Instrument (GI) Corporation CFT-2200. This application will monitor the channel watching characteristics of individuals watching television and report the information on a return line e.g., an upstream cable

20   (FSK) channel. This information will be reported on a repeated basis and is intended to interface a server database such as that set forth in co-pending application serial number 09/069,609 for Data Communication System, assigned to the common assignee, designated as Sockeye.

25   The substance of that disclosure is incorporated by reference herein.

Set-top Information

This section describes how to prepare the audience engine application for the General Instruments CFT2200 set-top

30   box.

Programming the Production CFT2200

To program a production CFT2200 execute the following steps:

The sockeye.c, sockeye.abs, soc3100.det, 3100SOC?.dat,

35   and 3100SOC?.dsc files (where "?" is the revision).

Put the .dat and .dsc files on a blank floppy.

Connect the CFT to be programmed to the OLL PC.

-16-

Power on the OLL PC.

Insert the floppy in the OLL PC.

Select command 3, load files from floppy, in the OLL program.

5   Select command 2, off- line loader, in the OLL program. This will convert the new files into a downloadable set _ of files.

Set the active file to the 3100soc? file. If this is not the active file, you need to deselect the current active

10   and select the new file using the commands in the monolithic file menu.

Program the CFT2200 by executing command 1, send monolithic.

Audience Engine Disk Contents

15   The Audience Engine disk contains the following:

Sockeye.c, the source code.

Sockeye.abs, output from linker.

3100SOC4.dat, actual downloaded data file.

3100SOC4.dsc, description of downloaded file.

20   Sock3100.det, specifies objects to download.

Known Problems

The following problems were found during testing:

Must use b6-0(7) ROMs or above.

Head End Information

25   This is the Catalog.dat file for the ACC4000. The highlighted lines are lines we changed.

This is the data file for the IR Blaster quick implementation. In Phase II, this info will be maintained in the database. The data begins in the 5th

30   line of the file. This is the general catalog information.

1   [005]   Number of minutes for next download (0 = no downloading)

05   [006]   Catalog sequence number

35   Just increment the number every time you change the file.

01   [007]   Catalog revision number

```
      1994  [008]    Year for catalog implementation
      10    [009]    Month for catalog implementation
      31    [010]    Day for catalog implementation
      12    [011]    Hour for catalog implementation
 5    30    [012]    Minute for catalog implementation
      14    [013]    Number of catalog entries           _
      DS_CATL1[100]   Catalog entry - source id (up to but not
      longer than 8 characters.  Fill with blanks if less than
      8 characters)
10    1     [101]    Catalog entry - number of catalog records
      for this catalog entry
      1     [102]    Catalog entry - preferred catalog record
      for this catalog entry
      16    [110]    Catalog record - device
15    00    [111]    Catalog record - device details
      00    [112]    Catalog record - data use
      00    [113]    Catalog record - data use details
      00    [114]    Catalog record - application id
      00    [115]    Catalog record - channel
20    01    [116]    Catalog record - channel type
      DL_SYSL1[200]   Catalog entry - source id (up to but not
      longer than 8 characters.  Fill with blanks if less than
      8 characters)
      1     [201]    Catalog entry - number of catalog records
25    for this catalog entry
      1     [202]    Catalog entry - preferred catalog record
      for this catalog entry
      16    [210]    Catalog record - device
      00    [211]    Catalog record - device details
30    00    [212]    Catalog record - data use
      00    [213]    Catalog record - data use details
      01    [214]    Catalog record - application id
      00    [215]    Catalog record - channel
      01    [216]    Catalog record - channel type
35    DL_PLAT1[300]   Catalog entry - source id (up to but not
      longer than 8 characters.  Fill with blanks if less than
      8 characters)
```

```
     1    [301]     Catalog entry - number of catalog records
     for this catalog entry
     1    [302]     Catalog entry - preferred catalog record
     for this catalog entry
5    16   [310]     Catalog record - device
     00   [311]     Catalog record - device details        —
     00   [312]     Catalog record - data use
     00   [313]     Catalog record - data use details
     02   [314]     Catalog record - application id
10   00   [315]     Catalog record - channel
     01   [316]     Catalog record - channel type
     DL_APPL1[400]  Catalog entry - source id (up to but not
     longer than 8 characters.  Fill with blanks if less than
     8 characters)
15   1    [401]     Catalog entry - number of catalog records
     for this catalog entry
     1    [402]     Catalog entry - preferred catalog record
     for this catalog entry
     16   [410]     Catalog record - device
20   00   [411]     Catalog record - device details
     00   [412]     Catalog record - data use
     00   [413]     Catalog record - data use details
     03   [414]     Catalog record - application id
     00   [415]     Catalog record - channel
25   01   [416]     Catalog record - channel type
     DL_CTRL1[500]  Catalog entry - source id (up to but not
     longer than 8 characters.  Fill with blanks if less than
     8 characters)
     1    [501]     Catalog entry - number of catalog records
30   for this catalog entry
     1    [502]     Catalog entry - preferred catalog record
     for this catalog entry
     16   [510]     Catalog record - device
     00   [511]     Catalog record - device details
35   00   [512]     Catalog record - data use
     00   [513]     Catalog record - data use details
     04   [514]     Catalog record - application id
```

-19-

```
        00    [515]      Catalog record - channel
        01    [516]      Catalog record - channel type
        DEF-IPG [600]    Catalog entry - source id (up to but not
        longer than 8 characters.  Fill with blanks if less than
    5   8 characters)
        1     [601]      Catalog entry - number of catalog records -
        for this catalog entry
        1     [602]      Catalog entry - preferred catalog record
        for this catalog entry
   10   16    [610]      Catalog record - device
        00    [611]      Catalog record - device details
        00    [612]      Catalog record - data use
        00    [613]      Catalog record - data use details
        256   [614]      Catalog record - application id
   15   00    [615]      Catalog record - channel
        01    [616]      Catalog record - channel type
        OSD      [700]   Catalog entry - source id (up to but not
        longer than 8 characters.  Fill with blanks if less than
        8 characters)
   20   1     [701]      Catalog entry - number of catalog records
        for this catalog entry
        1     [702]      Catalog entry - preferred catalog record
        for this catalog entry
        00    [710]      Catalog record - device
   25   16    [711]      Catalog record - device details
        02    [712]      Catalog record - data use
        02    [713]      Catalog record - data use details
        00    [714]      Catalog record - application id
        00    [715]      Catalog record - channel
   30   01    [716]      Catalog record - channel type
        DCRCHNAM[800]    Catalog entry - source id (up to but not
        longer than 8 characters.  Fill with blanks if less than
        8 characters)
        1     [801]      Catalog entry - number of catalog records
   35   for this catalog entry
        1     [802]      Catalog entry - preferred catalog record
        for this catalog entry
```

-20-

```
        16    [810]     Catalog record - device
        00    [811]     Catalog record - device details
        00    [812]     Catalog record - data use
        00    [813]     Catalog record - data use details
   5    10    [814]     Catalog record - application id
        00    [815]     Catalog record - channel
        01    [816]     Catalog record - channel type
        IrbVendr[900]   Catalog entry - source id (up to but not
        longer than 8 characters.  Fill with blanks if less than
  10    8 characters)
        1     [901]     Catalog entry - number of catalog records
        for this catalog entry
        1     [902]     Catalog entry - preferred catalog record
        for this catalog entry
  15    00    [910]     Catalog record - device
        16    [911]     Catalog record - device details
        00    [912]     Catalog record - data use
        00    [913]     Catalog record - data use details
        09    [914]     Catalog record - application id
  20    31    [915]     Catalog record - channel
        01    [916]     Catalog record - channel type
        IrbXRefr[A00]   Catalog entry - source id (up to but not
        longer than 8 characters.  Fill with blanks if less than
        8 characters)
  25    1     [A01]     Catalog entry - number of catalog records
        for this catalog entry
        1     [A02]     Catalog entry - preferred catalog record
        for this catalog entry
        00    [A10]     Catalog record - device
  30    16    [A11]     Catalog record - device details
        00    [A12]     Catalog record - data use
        00    [A13]     Catalog record - data use details
        09    [A14]     Catalog record - application id
        31    [A15]     Catalog record - channel
  35    01    [A16]     Catalog record - channel type
```

IrbDevDt[B00]   Catalog entry - source id (up to but not
longer than 8 characters. Fill with blanks if less than
8 characters)

1   [B01]   Catalog entry - number of catalog records
5   for this catalog entry

1   [B02]   Catalog entry - preferred catalog record _
for this catalog entry

00   [B10]   Catalog record - device

16   [B11]   Catalog record - device details

10   00   [B12]   Catalog record - data use

00   [B13]   Catalog record - data use details

09   [B14]   Catalog record - application id

37   [B15]   Catalog record - channel

01   [B16]   Catalog record - channel type

15   MenuLogo[C00]   Catalog entry - source id (up to but not
longer than 8 characters. Fill with blanks if less than
8 characters)

1   [C01]   Catalog entry - number of catalog records
for this catalog entry

20   1   [C02]   Catalog entry - preferred catalog record
for this catalog entry

16   [C10]   Catalog record - device

00   [C11]   Catalog record - device details

00   [C12]   Catalog record - data use

25   00   [C13]   Catalog record - data use details

11   [C14]   Catalog record - application id

00   [C15]   Catalog record - channel

01   [C16]   Catalog record - channel type

FEM_CNFG[D00] - Catalog entry - source id (up to but not
30   longer than 8 characters. Fill with blanks if less than
8 characters)

01   [D01] - Catalog entry - number of catalog records
for this catalog entry

01   [D02] - Catalog entry - preferred catalog record

35   16   [D10] - Catalog entry - device

00   [D11] - Catalog entry - device details

00   [D12] - Catalog entry - data use

-22-

```
       00   [D13] - Catalog entry - data use details
       13   [D14] - Catalog entry - application id
       00   [D15] - Catalog entry - channel
       01   [D16] - Catalog entry - channel type
  5  Sockeye [E00] - Catalog entry - source id (up to but not
     longer than 8 characters.  Fill with blanks if less than
     8 characters)
       01   [E01] - Catalog entry - number of catalog records
     for this catalog entry
 10    01   [E02] - Catalog entry - preferred catalog record
       240  [E10] - Catalog entry - device
       00   [E11] - Catalog entry - device details
       00   [E12] - Catalog entry - data use
       00   [E13] - Catalog entry - data use details
 15    00   [E14] - Catalog entry - application id
       70   [E15] - Catalog entry - channel 7.0 Mhz
       01   [E16] - Catalog entry - channel type
     This is Sockeye specific info.  After entering data save
     file & type "irbcfg" at the UNIX prompt.
 20  /****************************************************************
     *
     *    COPYRIGHT Millennium Networks Inc. 1998.
     *
     *    ALL RIGHTS RESERVED.
 25  *
     *    NO PART OF THIS CODE MAY BE COPIED OR MODIFIED WITHOUT THE
     *    WRITTEN CONSENT OF Millennium Networks Inc..
     ****************************************************************/

 30  /****************************************************************
     *
     *    DESCRIPTION: Source file for the Sockeye application on the
     *           CFT-2200.
     *
 35  *  REVISION HISTORY:
     *
     *  Date    Name         Description
     *  ------- -----------  ---------------------------------------------
     *  03/08/98  C. Michael    Creation
 40  *
     ****************************************************************/

     #include <string.h>
     #include "jctype.h"
 45  #include "api.h"
     #include "osapi.h"
```

-23-

```
        #include "tuner.h"
        #include "downstrm.h"
        #include "upstream.h"
        #include "giutil.h"
 5      #include "system.h"
        #include "srvrmesg.h"

        /* Version used by the object module converter, see section 5.1 of the
         * "CFT-2200 Downloadable Firmware Programmer's Guide"
10       */
        GLOBAL const PCHAR objectVersion = "01.04";

        /* macro for converting seconds into ticks */
        #define SECS(secs)   (secs * TICKS_PER_SEC)
15
        /* The following constant defines the periodic interval of the audience
         * engine.  The audience engine will get the channel status information
         * each time this timer expires and it will send it upstream.
         */
20      #define SOCKEYE_WAKEUP_INTERVAL    15

        /* the following constant defines how long the application will delay
         * when it fails to get a message buffer before retrying.
         */
25      #define GET_MSG_DELAY              SECS(1)

        /* Events used by the audience engine task */
        #define SOCKEYE_WAKEUP_EVENT       0x00000001

30      /* definitions used by ReceiveMessage() function */
        #define NO_QUEUE        0
        #define NO_REQUEST      (API_VERSION_REQUEST - 1)
        #define QWAIT_TIMEOUT   SECS(5)

35      /* the following constants define the valid types of cable */
        #define CABLE_TYPE_A    0
        #define CABLE_TYPE_B    1

        /* define the structure containing the upstream data */
40      typedef struct
        {
            UCHAR       hour;
            UCHAR       minute;
            UCHAR       second;
45
            UCHAR       ucReserved  :7;
            UCHAR       CableType    :1; /* 0:cable A, 1:cable B */

            UWORD       TunerNum;
50      } SockeyeData;

        /* define the message queue name */
        const QueueNames SockeyeQname = QNAME('S','O','C','Q');

55      /* The following variables contain the ID's of the resources
```

-24-

```
     * used by the sockeye application.
     */
     GLOBAL  LONG    SockeyeTaskId;
     GLOBAL  LONG    SockeyeQueueId;
 5   GLOBAL  LONG    TunerQueueId;
     GLOBAL  LONG    UpstreamQueueId;
     GLOBAL  LONG    DownstreamQueueId;
     GLOBAL  LONG    SystemQueueId;
     GLOBAL  LONG    UpstreamOpenId;
10
     /* The following variable indicates whether the constructor has been
      * called yet.
      */
     GLOBAL  BOOL    Constructed;
15
     /* statistics used for debugging the sockeye application */
     GLOBAL  LONG    SockeyeUpstreamSendFailed;
     GLOBAL  LONG    SockeyeUpstreamCloseFailed;

20   /* local prototypes */
     extern LONG SockeyeConstructor(VOID);
     extern LONG SockeyeDestructor(BOOL bContextSave);
     VOID SockeyeTeardown(VOID);
     BOOL SockeyeInit(VOID);
25   BOOL ReceiveMessage(QueueNames qName, UWORD uwRequest, PCHAR *pResp);
     BOOL SockeyeGetTunerInfo(SockeyeData *pSockeyeMsg);
     BOOL SockeyeOpenUpstream(VOID);
     BOOL SockeyeSendUpstream(SockeyeData *pSockeyeData);
     BOOL SockeyeCloseUpstream(VOID);
30   VOID SockeyeTask(PVOID pv);
     BOOL SockeyeGetDownstreamCatalog(VOID);


     /****************************************************************
     *
35   * FUNCTION:    SockeyeConstructor
     *
     * DESCRIPTION: Constructor for the sockeye application.  This
     *   function is called by the CFT application.  It spawns the sockeye
     *   task.
40   *
     ************************************************************************/
     extern LONG SockeyeConstructor(VOID)
     {
         LONG    RetCode;
45
         /* initialize the IDs of all the objects to NULL */
         SockeyeTaskId = NULL_ID;
         SockeyeQueueId = NULL_ID;
         TunerQueueId = NULL_ID;
50       UpstreamQueueId = NULL_ID;
         DownstreamQueueId = NULL_ID;
         SystemQueueId = NULL_ID;
         UpstreamOpenId = NULL_ID;

55
```

-25-

```
          /* set the flag indicating the constructor has been called */
          Constructed = TRUE;

          /* start the sockeye applications task */
  5       RetCode = OScreateUserTask((VOID(*)(PVOID))SockeyeTask,
                         PRI_NORMAL_USER,
                         START_RUN + NO_TIME_SLICE + INTRPT_ENABLE,
                         0,
                         0,
  10                      NULL,
                         0,
                         &SockeyeTaskId);

          return RetCode;
  15    }


          /*****************************************************************
           *
           * FUNCTION:   SockeyeDestructor
  20       *
           * DESCRIPTION: Destructor for the sockeye application. This
           *   function is called by the CFT application. It destructs the sockeye
           *   task and frees all of the resources allocated to the task.
           *
  25       *****************************************************************/
          extern LONG SockeyeDestructor(BOOL bContextSave)
          {
             LONG    RetCode = 0;

  30        /* eliminate unused variable warning */
             if(bContextSave)
                RetCode = 0;

             /* check if the constructor has been called yet */
  35        if(Constructed)
             {
                /* free any resources used by the audience engine task */
                SockeyeTeardown();

  40           /* delete the task */
                RetCode = OSdeleteTask(SockeyeTaskId);
             }
             return RetCode;
          }
  45
          /*****************************************************************
           *
           * FUNCTION:   SockeyeTeardown
           *
  50       * DESCRIPTION: This function frees any resources used by the sockeye
           *   task. It is called when the task is deleted and also if initialization
           *   fails to complete successfully.
           *
           *****************************************************************/
  55    VOID SockeyeTeardown(VOID)
```

```
      {
         PCHAR   pResp;
         BOOL    bDone = FALSE;

5        /* close the upstream device if its open */
         if(UpstreamOpenId != NULL_ID)
         {
            while(!bDone)
               bDone = SockeyeCloseUpstream();
10       }

         if(SockeyeQueueId != NULL_ID)
         {
            /* Flush the queue and delete it */
15          ReceiveMessage(NO_QUEUE, NO_REQUEST, &pResp);
            OSdeleteQueue(SockeyeQueueId, FORCE_DELETE);
         }
      }

20    /*****************************************************************
       *
       * FUNCTION:    SockeyeInit
       *
       * DESCRIPTION:  This function performs the initialization of the sockeye
25     *    task. It creates the tasks message queue, event group, and starts
       *    the periodic timer of the sockeye application. It also opens the upstream
       *    device.  This function returns the ID associated with the upstream
       *    device open.
       *
30     *****************************************************************/
      BOOL SockeyeInit(VOID)
      {
         LONG RetCode;
         BOOL bDone;
35
         /* set all IDs to NULL */
         SockeyeQueueId = NULL_ID;
         TunerQueueId = NULL_ID;
         UpstreamQueueId = NULL_ID;
40       DownstreamQueueId = NULL_ID;
         SystemQueueId = NULL_ID;
         UpstreamOpenId = NULL_ID;

         /* Initialize the statistics */
45       SockeyeUpstreamSendFailed = 0;
         SockeyeUpstreamCloseFailed = 0;

         /* Create the sockeye tasks message queue */
         RetCode  =  OScreateQueue(SockeyeQname,  20,  PEND_PRIORITY,
50    &SockeyeQueueId);

         if(RetCode == OS_RETURN_OK)
         {
            /* identify the TUNER queue */
55          RetCode = OSidentifyQueue(TUNER, &TunerQueueId);
```

```
        }

        if(RetCode = = OS_RETURN_OK)
        {
5           /* identify the SYSTEM queue */
            RetCode = OSidentifyQueue(SYSTEM, &SystemQueueId);
        }

        if(RetCode = = OS_RETURN_OK)
10      {
            /* identify the UPSTREAM queue */
            RetCode = OSidentifyQueue(UPSTREAM, &UpstreamQueueId);
        }

15      if(RetCode = = OS_RETURN_OK)
        {
            /* identify the DOWNSTREAM queue */
            RetCode = OSidentifyQueue(DOWNSTREAM, &DownstreamQueueId);
        }
20
        /* read the upstream catalog entry from the downstream server */
        bDone = FALSE;
        while(!bDone)
        {
25          bDone = SockeyeGetDownstreamCatalog();
            if(!bDone)
                OSwakeAfterTimer(GET_MSG_DELAY);
        }

30      /* open the upstream device */
        bDone = FALSE;
        while(!bDone)
        {
            bDone = SockeyeOpenUpstream();
35          if(!bDone)
                OSwakeAfterTimer(GET_MSG_DELAY);
        }

        if(RetCode = = OS_RETURN_OK)
40          return TRUE;
        else
            return FALSE;
    }

45  /*****************************************************************
    *
    * FUNCTION:    ReceiveMessage
    *
    * DESCRIPTION: This function receives a message from the sockeye
50  *   queue. It returns a BOOLEAN which indicates whether the specified
    *   message was received.
    *
    *   If the message on the queue isn't the expected message this routine
    *   discards the message and gets the next message from the sockeye queue.
55  *
```

```
*********************************************************************/
BOOL ReceiveMessage(
    QueueNames  qName,
    UWORD       uwRequest,
    PCHAR       *pResp)
{
    ApiResponseHeader  *pHeader;
    LONG            RetCode;
    BOOL            bDone = FALSE;
    BOOL            bReturn = FALSE;

    while(!bDone)
    {
        RetCode = OSreceiveMessage(SockeyeQueueId,
                        QWAIT_TIMEOUT,
                        pResp);
        pHeader = (ApiResponseHeader *)(*pResp);

        if(RetCode == OS_RETURN_OK)
        {
            if((pHeader->queueName == qName) &&
               (pHeader->uwRequest == uwRequest))
            {
                bDone = TRUE;
                bReturn = TRUE;
            }
            else
            {
                /* Not the message we wanted, discard it and get the next
                 * message on the queue.
                 */
                OSfreeMessage(*pResp);
            }
        }
        else
        {
            bDone = TRUE;
        }
    }
    return bReturn;
}

/*************************************************************
 *
 * FUNCTION:    SockeyeGetTunerInfo
 *
 * DESCRIPTION:  This function determines the channel the CFT is currently
 *     tuned to.  If this function is unable to determine the channel the CFT
 *     is tuned to this function returns FALSE and sets the returned channel
 *     number to 0, otherwise it returns TRUE along with the channel the unit
 *     is tuned to.
 *
 *************************************************************/
BOOL SockeyeGetTunerInfo(SockeyeData *pSockeyeMsg)
{
```

-29-

```
            TunerResponseMessage    *pTunerRespMsg;
            SysResponseMessage      *pSystemRespMsg;
            Timespec          Time;
            BOOL              bDone;
    5       BOOL              bReturn=FALSE;

            /* SendRequestChannelStatus() [should do what I'm trying to do here] */
            SendRequestChannelStatus ( &TunerQueueId, 1, SockeyeQueueId, 0);

    10      /* wait for the response */
            bDone   =   ReceiveMessage(TUNER,   USER_CHANNEL_STATUS,   (PCHAR
            *)&pTunerRespMsg);
            if(bDone)
            {
    15        if(pTunerRespMsg->header.error = = OS_RETURN_OK)
              {
                            p S o c k e y e M s g - > T u n e r N u m      =
            pTunerRespMsg->data.tunerStatus.uwUserChannel;
                            p S o c k e y e M s g - > C a b l e T y p e      =
    20      pTunerRespMsg->data.tunerStatus.ibbType.ucCable;

                  bReturn = TRUE;
                }
                OSfreeMessage((PCHAR)pTunerRespMsg);
    25      }

            if(bReturn = = FALSE)
            {
              pSockeyeMsg->TunerNum = 1;
    30        pSockeyeMsg->CableType = CABLE_TYPE_A;
            }

            /* zero out the reserved field */
            pSockeyeMsg->ucReserved = 0;
    35
            /* wait for the response */
            if(bReturn)
            {
              /* get the ON/OFF status information */
    40        SendSysRequestStatus( &SystemQueueId, 1, SockeyeQueueId);

              bDone   =   ReceiveMessage(SYSTEM,   SYS_REQUEST_STATUS,   (PCHAR
            *)&pSystemRespMsg);
              if(bDone)
    45        {
                if(pSystemRespMsg->header.error = = OS_RETURN_OK)
                {
                  if(!pSystemRespMsg->data.sysStatus.bAcRelayOn)
                    pSockeyeMsg->TunerNum = 0;
    50
                  bReturn = TRUE;
                }
                OSfreeMessage((PCHAR)pSystemRespMsg);
              }
    55
```

```
        }

        /* fill in the timestamp */
        if(OSgetClock(&Time) = = OS_RETURN_OK)
5       {
           pSockeyeMsg->hour = Time.ucHour;
           pSockeyeMsg->minute = Time.ucMinute;
           pSockeyeMsg->second = Time.ucSecond;
        }
10      else
        {
           pSockeyeMsg->hour = 24;
           pSockeyeMsg->minute = 60;
           pSockeyeMsg->second = 60;
15      }

        return bReturn;
    }

20  /*****************************************************************
     *
     * FUNCTION:    SockeyeGetDownstreamCatalog
     *
     * DESCRIPTION: This function sends the downstream catalog read command to the
25   *  DOWNSTREAM application.  If an entry for the sockeye application can't be
     *  found the function returns FALSE, otherwise TRUE is returned.
     *
     *****************************************************************/
    BOOL SockeyeGetDownstreamCatalog(VOID)
30  {
        LONG   RetCode;
        DownstreamRequestMessage *pDownstreamReqMsg;
        DownstreamResponseMessage *pDownstreamRespMsg;
        BOOL   bDone;
35      BOOL   bReturn = FALSE;

        /* get a buffer to send the messages to the upstream application */
        while(OSallocateMessage(100,   (PCHAR   *)&pDownstreamReqMsg)   ! =
    OS_RETURN_OK)
40          OSwakeAfterTimer(GET_MSG_DELAY);

        /* fill in the request */
        pDownstreamReqMsg->header.queueName = DOWNSTREAM;
        pDownstreamReqMsg->header.uwRequest = DOWNSTREAM_CATALOG_READ;
45      pDownstreamReqMsg->header.lRequestNumber = 1;
        pDownstreamReqMsg->header.response.lQid = SockeyeQueueId;
        memcpy(pDownstreamReqMsg->data.catalogRead.destination,   "Sockeye   ",
    SOURCE_ID_LENGTH);

50      /* send the request to the upstream server */
        RetCode = OSsendMessage(DownstreamQueueId, (PCHAR)pDownstreamReqMsg);
        if(RetCode = = OS_RETURN_OK)
        {
           /* wait for the response */
55         bDone = ReceiveMessage(DOWNSTREAM,
```

-31-

```
                              DOWNSTREAM_CATALOG_READ,
                              (PCHAR *)&pDownstreamRespMsg);
              if(bDone)
              {
 5               if(pDownstreamRespMsg->header.error = = NO_ERROR)
                 {
                    bReturn = TRUE;
                 }
                 OSfreeMessage((PCHAR)pDownstreamRespMsg);
10            }
          }
          return bReturn;
      }

15   /***********************************************************************
      *
      * FUNCTION:    SockeyeOpenUpstream
      *
      * DESCRIPTION: This function sends the direct upstream open command to the
20    *  UPSTREAM application.
      *
      ***********************************************************************/
      BOOL SockeyeOpenUpstream(VOID)
      {
25       LONG   RetCode;
         UpstreamRequestMessage *pUpstreamReqMsg;
         UpstreamResponseMessage *pUpstreamRespMsg;
         BOOL   bDone;
         BOOL   bReturn = FALSE;
30
         /* get a buffer to send the messages to the upstream application */
         while(OSallocateMessage(100, (PCHAR *)&pUpstreamReqMsg) != OS_RETURN_OK)
            OSwakeAfterTimer(GET_MSG_DELAY);

35       /* fill in the request */
         pUpstreamReqMsg->header.queueName = UPSTREAM;
         pUpstreamReqMsg->header.uwRequest = DIRECT_UPSTREAM_OPEN;
         pUpstreamReqMsg->header.lRequestNumber = 1;
         pUpstreamReqMsg->header.response.IQid = SockeyeQueueId;
40         memcpy(pUpstreamReqMsg->data.directOpen.destination,   "Sockeye   ",
      SOURCE_ID_LENGTH);
         pUpstreamReqMsg->data.directOpen.ucIdleTime = MAX_IDLE_TIMEOUT;
            pUpstreamReqMsg->data.directOpen.ucTransmitLevel   =
      SYSTEM_TRANSMIT_LEVEL;
45
         /* send the request to the upstream server */
         RetCode = OSsendMessage(UpstreamQueueId, (PCHAR)pUpstreamReqMsg);
         if(RetCode = = OS_RETURN_OK)
         {
50          /* wait for the response */
            bDone = ReceiveMessage(UPSTREAM,
                        DIRECT_UPSTREAM_OPEN,
                        (PCHAR *)&pUpstreamRespMsg);
            if(bDone)
55          {
```

-32-

```
                if(pUpstreamRespMsg->header.error = = NO_ERROR)
                {
                    bReturn = TRUE;
                    UpstreamOpenId = pUpstreamRespMsg->data.directOpen.lOpenId;
5               }
                OSfreeMessage((PCHAR)pUpstreamRespMsg);
            }
        }
        return bReturn;
10  }


    /*****************************************************************
     *
     * FUNCTION:    SockeyeSendUpstream
15   *
     * DESCRIPTION: This function sends the upstream message to the UPSTREAM
     *   application for transmission.
     *
     *****************************************************************/
20  BOOL SockeyeSendUpstream(SockeyeData *pSockeyeData)
    {
        LONG    RetCode;
        UpstreamRequestMessage *pUpstreamReqMsg;
        UpstreamResponseMessage *pUpstreamRespMsg;
25      BOOL    bDone;
        BOOL    bReturn = FALSE;
        BOOL    bMsgSent = FALSE;

        while(!bMsgSent)
30      {
            /* get a buffer to send the messages to the upstream application */
            while(OSallocateMessage(100,   (PCHAR   *)&pUpstreamReqMsg)   ! =
    OS_RETURN_OK)
                OSwakeAfterTimer(GET_MSG_DELAY);
35
            /* fill in the request */
            pUpstreamReqMsg->header.queueName = UPSTREAM;
            pUpstreamReqMsg->header.uwRequest = DIRECT_UPSTREAM_WRITE;
            pUpstreamReqMsg->header.lRequestNumber = 1;
40          pUpstreamReqMsg->header.response.lQid = SockeyeQueueId;

            /* Fill in the sizeof the application data and the data. The size of
             * the application data is hardcoded because the compiler thinks the
             * sizeof the application data is 8 not 6. I think this occurs because
45           * of padding, but I don't know how to disable it.
             */
            pUpstreamReqMsg->data.directWrite.lOpenId = UpstreamOpenId;
            pUpstreamReqMsg->data.directWrite.uwSize = 6;
            pUpstreamReqMsg->data.directWrite.pcBuffer = (PCHAR)pSockeyeData;
50
            /* send the request to the upstream server */
            RetCode = OSsendMessage(UpstreamQueueId, (PCHAR)pUpstreamReqMsg);
            if(RetCode = = OS_RETURN_OK)
            {
55              /* wait for the response */
```

-33-

```
        bDone = ReceiveMessage(UPSTREAM,
                        DIRECT_UPSTREAM_WRITE,
                        (PCHAR *)&pUpstreamRespMsg);
        if(bDone)
5       {
            if(pUpstreamRespMsg->header.error == NO_ERROR)
            {
                bMsgSent = TRUE;
                bReturn = TRUE;
10          }
            else if((pUpstreamRespMsg->header.error == DEVICE_NOT_RESERVED)
        ||
                    (pUpstreamRespMsg->header.error == NOT_AVAILABLE) ||
                    (pUpstreamRespMsg->header.error == INVALID_ID))
15          {
                /* open the upstream device */
                bDone = FALSE;
                while(!bDone)
                    bDone = SockeyeOpenUpstream();
20          }

            OSfreeMessage((PCHAR)pUpstreamRespMsg);
            }
        }
25      }
        return bReturn;
    }


    /*****************************************************************
30   *
     * FUNCTION:    SockeyeCloseUpstream
     *
     * DESCRIPTION:  This function sends the direct upstream close command to the
     *   UPSTREAM application.
35   *
     *****************************************************************/
    BOOL SockeyeCloseUpstream(VOID)
    {
        LONG    RetCode;
40      UpstreamRequestMessage *pUpstreamReqMsg;
        UpstreamResponseMessage *pUpstreamRespMsg;
        BOOL    bDone;
        BOOL    bReturn=FALSE;

45      /* get a buffer to send the messages to the upstream application */
        while(OSallocateMessage(100, (PCHAR *)&pUpstreamReqMsg) != OS_RETURN_OK)
            OSwakeAfterTimer(GET_MSG_DELAY);

        /* fill in the request */
50      pUpstreamReqMsg->header.queueName = UPSTREAM;
        pUpstreamReqMsg->header.uwRequest = DIRECT_UPSTREAM_CLOSE;
        pUpstreamReqMsg->header.lRequestNumber = 1;
        pUpstreamReqMsg->header.response.lQid = SockeyeQueueId;
        pUpstreamReqMsg->data.directClose.lOpenId = UpstreamOpenId;
55
```

-34-

```
          /* send the request to the upstream server */
          RetCode = OSsendMessage(UpstreamQueueId, (PCHAR)pUpstreamReqMsg);
          if(RetCode = = OS_RETURN_OK)
          {
 5           /* wait for the response */
             bDone = ReceiveMessage(UPSTREAM,
                            DIRECT_UPSTREAM_CLOSE,
                            (PCHAR *)&pUpstreamRespMsg);
             if(bDone)
10           {
                if(pUpstreamRespMsg->header.error = = NO_ERROR)
                   bReturn = TRUE;

                OSfreeMessage((PCHAR)pUpstreamRespMsg);
15           }
          }
          return bReturn;
       }

20   /***************************************************************
      *
      * FUNCTION:    SockeyeTask
      *
      * DESCRIPTION:  Main function for the sockeye application.  This
25    *    task initializes the resources it needs and then goes into an infinite
      *    loop waiting for the 15 second timer to expire.  Every 15 seconds this
      *    task wakes up, gets the current channel status, creates an upstream
      *    message containing the data, and sends the data upstream.  It then goes
      *    back to sleep waiting for the 15 second timer to expire.
30    *
      ***************************************************************/
      VOID SockeyeTask(PVOID pv)
      {
          SockeyeData SockeyeMsg;
35        BOOL      bDone = FALSE;
          BOOL      bTunerDataOk;

          /* eliminate unused variable warning */
          if(pv)
40           bDone = FALSE;

          /* loop until initialization completes */
          while(!bDone)
          {
45           bDone = SockeyeInit();
             if(!bDone)
             {
                /* If initialization fails undo everything, wait, and try again */
                SockeyeTeardown();
50              OSwakeAfterTimer(10L);
             }
          }

          for(;;)
55        {
```

-35-

```
         /* wait for the periodic timer to expire */
         OSwakeAfterTimer(SECS(SOCKEYE_WAKEUP_INTERVAL));

         /* get the current channel status information */
5        bTunerDataOk = SockeyeGetTunerInfo(&SockeyeMsg);

         if(bTunerDataOk)
         {
            /* create the upstream message and send it */
10          if(!SockeyeSendUpstream(&SockeyeMsg))
               SockeyeUpstreamSendFailed + +;
         }
      }
   }
15
```

GI Requested Information

SOFTWARE RELEASE NOTES

PRODUCT: MN_GI_CFT (22DB3200 with Millennium Networks
Audience Engine)

20 Software Version: 22DJ3606 (Millennium - Version
1.0)

Upgraded from Previous Release: None

Release Date: 7/7/98

Reset Qualifier: 169

25 Definition: This note defines changes to the
DOWNLOADABLE FILE which is downloaded to the

          Settop Feature Expansion Module by the ACC4000
controller, or the Off-Line Loader.

Description of Changes and New Features:

30 <Supply information here>

Major problems fixed in this release:

This release is the first release of this product.

Warnings / known problems / bugs / special instructions
pertinent to this release:

35 <Supply information here>

Installation issues:

 FORMTEXT

Compatibility:

This software release can be installed on the following

40 hardware:

          FORMTEXT

-36-

This software release is compatible with the following
equipment / other software / systems components:
FORMTEXT

Release Package Checklist

5   The following components are included in this release:
rdj3606d.doc
Sockeye.abs v. 1.0   code that is included in the
monolithic file that is downloaded to UPM flash memory
3100SOCO.DAT

10 3100SOCO.DSC
Sock3100.det
Related Documents
<Release Notes for Audience Engine>
CFT-2200 System Resource Utilization

15 Maximum number of application tasks: 1
Maximum number of application message queues: 1, "SOCQ"
Memory configuration (configured / max used):
512K Flash /   >1K
512K DRAM /   >1K

20 NVRAM / 0K
Brokered Items
Application IDs (AID) for downstream data:
None
Queue Names:

25 <Supply information here>
Catalog Configuration File Source IDs and Sample Entries:
Sockeye [E00] -
01   [E01] -
01   [E02] -

30 240   [E10] -
00   [E11] -
00   [E12] -
00   [E13] -
00   [E14] -

35 70   [E15] - Catalog entry - channel 7.0 Mhz
[E16] -]

-37-

The upstream frequency, e.g. 7.0, corresponds to the
frequency that will be used in your system to communicate
with the Sockeye modem.
Development Tool Versions

5   <Update version info as needed>
Microtec Research MCC68K ANSI C Compiler Version 4.5R   —
Microtec Research ASM68K Assembler Version 7.1J
Microtec Research 68K Linker Version 7.1J
Microtec Research LIB68k Librarian Version 10.7B

10   General Instrument Object Module Converter, Version 2.02
        REF docnum * MERGEFORMAT AP-080045-0047 (Revision REF
        revnum * MERGEFORMAT 1.0) XXXXXX for the YYYYYYYY
        PAGE 31

-38-

WHAT IS CLAIMED IS:

      1.   A method for monitoring television viewing habits of a television viewer, the method comprising the steps of:

5   a) storing information representative of television viewing habits in one of a television and — a set top box; and

      b) transmitting the stored information to a remote location.

10   2.   The method as recited in Claim 1, wherein the step of storing information representative of television viewing habits comprises storing information representative of television viewing habits in the television.

15   3.   The method as recited in Claim 1, wherein the step of storing information representative of television viewing habits comprises storing information representative of television viewing habits in the set top box.

20   4.   The method as recited in Claim 1, wherein the step of storing information representative of television viewing habits comprises storing an identification code, time, channel, and channel source.

      5.   The method as recited in Claim 1, wherein the
25 step of storing information representative of television viewing habits comprises storing the information in a non-volatile memory.

      6.   The method as recited in Claim 1, wherein the step of storing information representative of television
30 viewing habits comprising storing only channel information for channels which are watched for a predetermined length of time.

      7.   The method as recited in Claim 1, wherein the step of transmitting the stored information comprises
35 transmitting the stored information periodically.

      8.   The method as recited in Claim 1, wherein the step of transmitting the stored information comprises

-39-

transmitting the stored information periodically at a predetermined time.

9.   The method as recited in Claim 1, wherein the step of transmitting the stored information comprises transmitting the stored information when requested to do so by a remote host.

10.   The method as recited in Claim 1, wherein the step of transmitting the stored information comprises transmitting the stored information via a bi-directional cable television cable.

11.   The method as recited in Claim 1, wherein the step of transmitting the stored information comprises transmitting the stored information via telephone.

12.   The method as recited in Claim 1, wherein the step of transmitting the stored information comprises transmitting the stored information via a radio modem.

13.   The method as recited in Claim 1, wherein the step of transmitting the stored information to a remote location comprises transmitting the stored information to an Internet web site.

14.   A set top box for providing cable television service and for monitoring television viewing habits of television viewers, the set top box comprising:

a)   an input port for receiving a plurality of cable television channels;

b)   an output port for communicating at least one cable television channel to a television;

c)   a non-volatile memory for storing instructions for performing monitoring of television viewing habits;

d)   a volatile memory for storing information representative of television viewing habits;

e)   monitoring software configured to monitor which channel is being viewed according to instructions stored in the non-volatile memory and for storing information representative of which

-40-

channel is being viewed and at what time in the
volatile memory.

15. The set top box as recited in Claim 14, further
comprising a cable data output circuit for transmitting
stored data representative of television viewing habits
to a remote location via a cable television cable.

16. The set top box as recited in Claim 14, further
comprising a telephone data output circuit for
transmitting stored data representative of television
viewing habits to a remote location via telephone.

17. The set top box as recited in Claim 14, further
comprising a radio modem for transmitting stored data
representative of television viewing habits to a remote
location via radio.

18. The set top box as recited in Claim 14, wherein
the first memory comprises a flash memory.

19. The set top box as recited in Claim 14, wherein
the second memory comprises a non-volatile memory.

20. A television monitoring and reporting system,
disposed within a television, which monitors and reports
viewing habits of television viewers, the system
comprising:

    a) a television input port for receiving a
plurality of cable television channels;

    b) a first memory disposed in the television
for storing instructions for performing monitoring
of television viewing habits;

    c) a second memory disposed in the television
for storing information representative of television
viewing habits.

    d) a monitoring circuit disposed in the
television and configured to monitor which channel
is being viewed according to instructions stored in
the first memory and for storing information
representative of which channel is being viewed and
at what time in the second memory.

-41-

21. The system as recited in Claim 20, further comprising a cable data output circuit for transmitting stored data representative of television viewing habits to a remote location via a cable television cable.

5   22. The system as recited in Claim 20, further comprising a telephone data output circuit for — transmitting stored data representative of television viewing habits to a remote location via telephone.

23. The system as recited in Claim 20, further

10   comprising a radio modem in electrical communication with the television for transmitting stored data representative of television viewing habits to a remote location via radio.

24. The system as recited in Claim 20, wherein the

15   first memory comprises a flash memory.

25. The system as recited in Claim 20, wherein the second memory comprises a non-volatile memory.

26. A method for monitoring and reporting television viewing habits of the television user

20   comprising:

communicating set of instructions in a television monitoring instructions to a television set top box by imbedding the instructions in an unused portion of a video signal communicated to the

25   set top box by a cable television connector from a cable service connector remote from the set top box;

generating television viewing data in response to the instructions;

storing the television viewing data in a memory

30   disposed within the set top box; and

uploading the stored data to the cable service location via the cable television connector.

27. The method as recited in Claim 26 further comprising the step of communicating an upload control

35   signal to the cable set top box via the cable television connector, the upload control signals being operative to
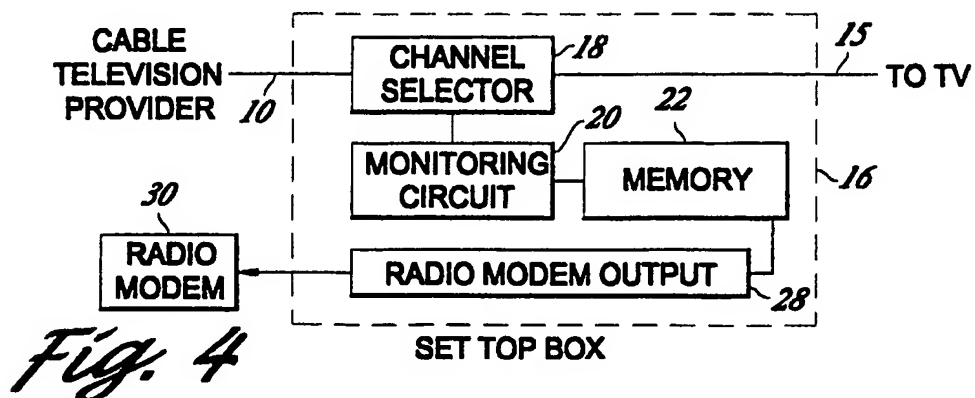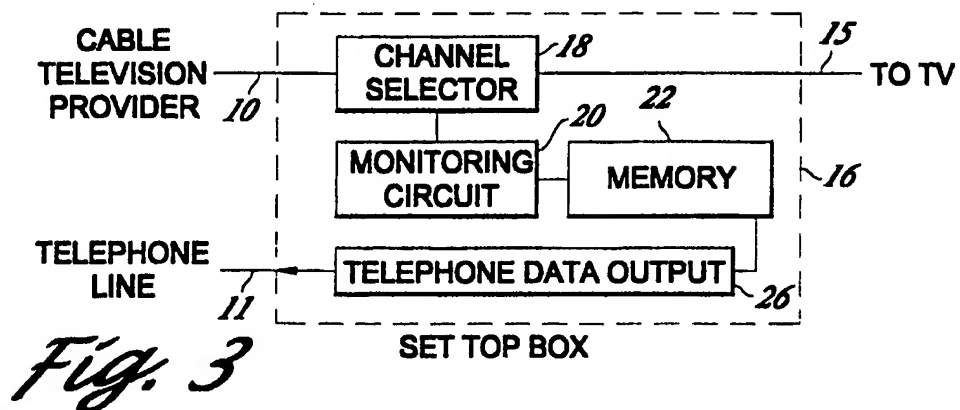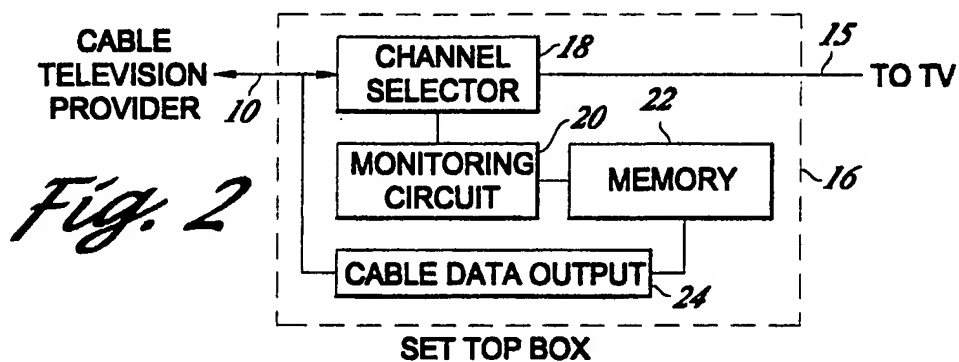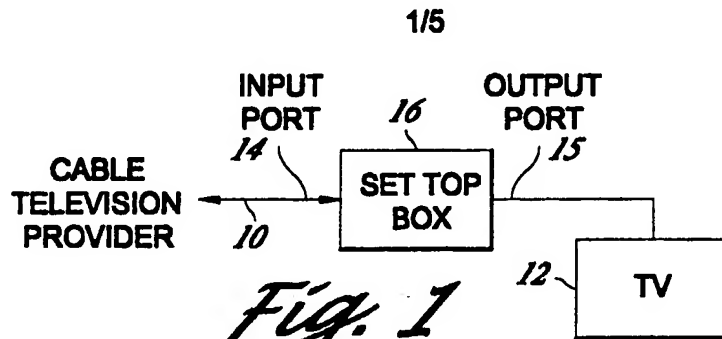
-42-

cause the stored viewing data to be uploaded to the cable service location.
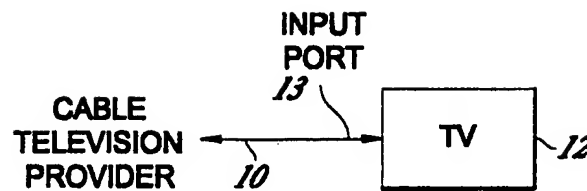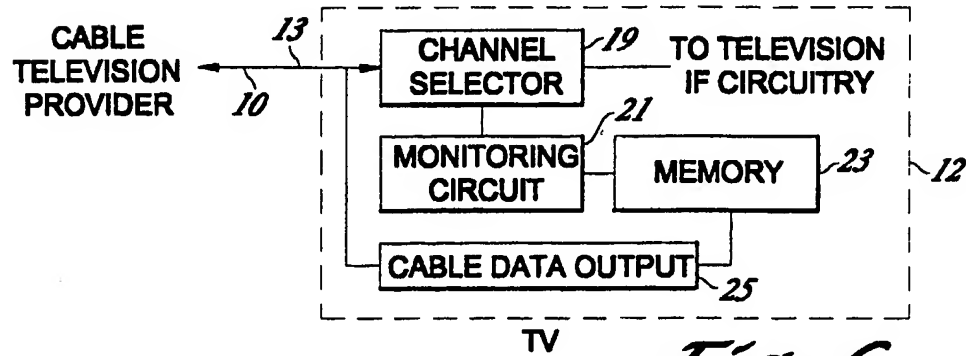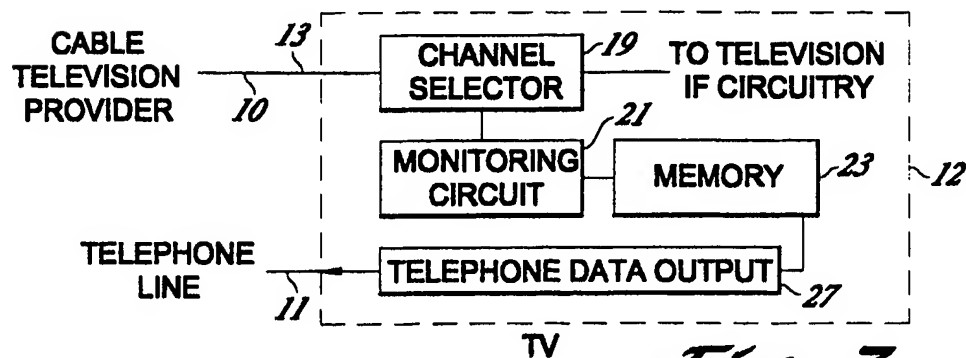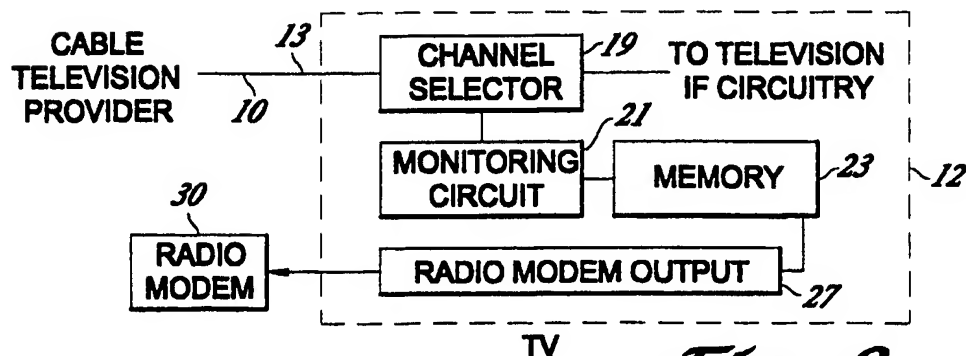
28.   The method as recited in Claim 27 wherein the control signals are communicated to the cable set top box
5   in a first unused portion of a video signal band width provided for a video signal communicated from the cable — service location to the set top box.

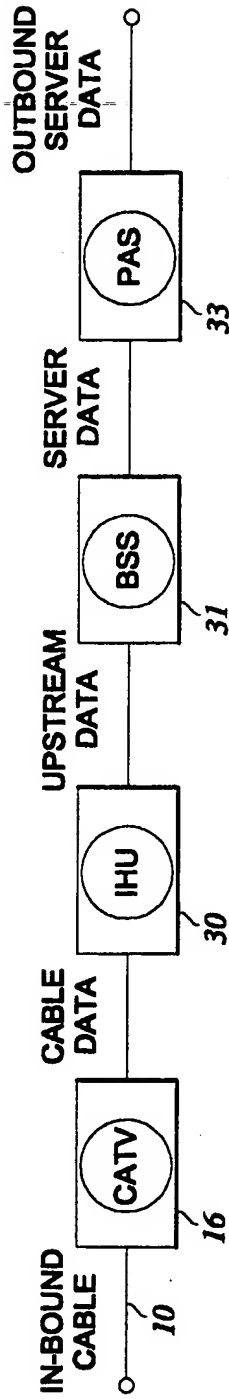29.   The method as recited in Claim 28 wherein the stored data is communicated from the cable set top box in
10   a second unused portion of the video signal bandwidth.

30.   The method as recited in Claim 28 wherein the stored data is communicated from the cable set top box in the first unused portion of the video signal bandwidth, when no control signals are being communicated to the set
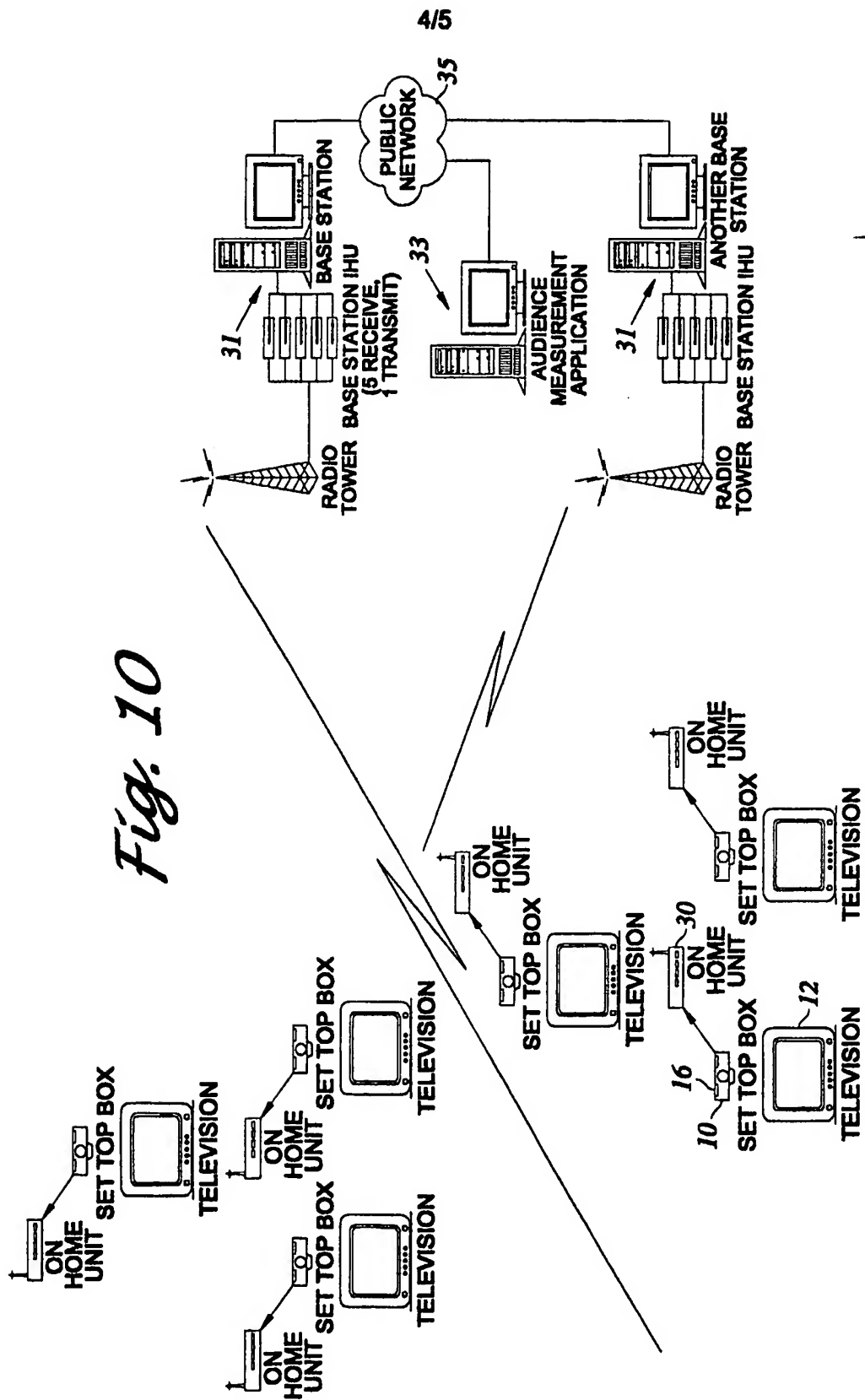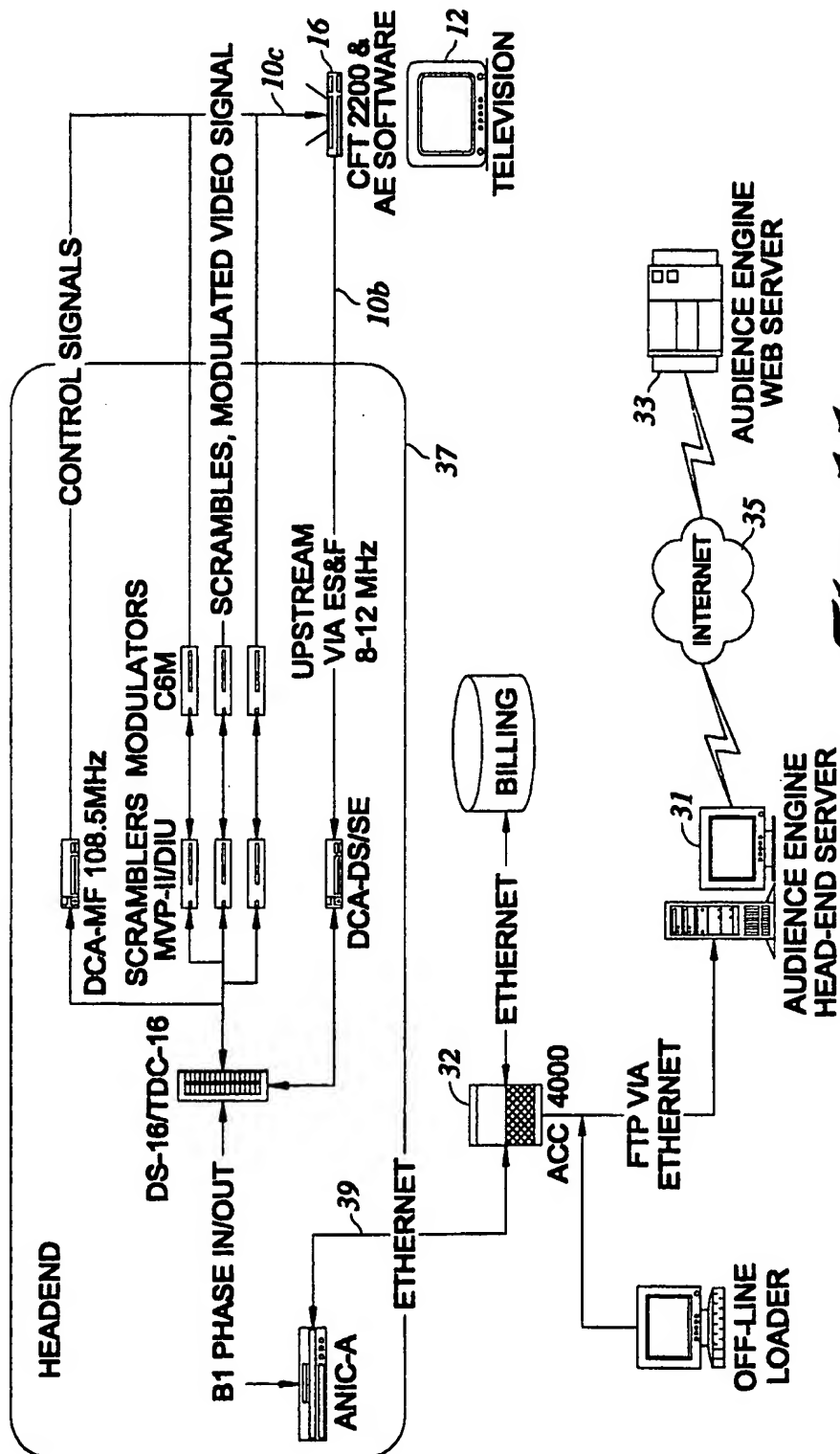15   top box.

1/5

INPUT
PORT   *16*   OUTPUT
                            PORT

CABLE   *14*   *15*
TELEVISION → | SET TOP |
PROVIDER *10* | BOX |

                                    12 → | TV |

Fig. 1

CABLE
TELEVISION → | CHANNEL | *18*   *15*
PROVIDER *10* | SELECTOR | ──────────── → TO TV

                              20   *22*
Fig. 2
                 | MONITORING | | MEMORY | *16*
                 | CIRCUIT |

                 | CABLE DATA OUTPUT | *24*

SET TOP BOX

CABLE
TELEVISION ── | CHANNEL | *18*   *15*
PROVIDER *10* | SELECTOR | ──────────── → TO TV

                              20   *22*
                 | MONITORING | | MEMORY | *16*
                 | CIRCUIT |

TELEPHONE
LINE ← | TELEPHONE DATA OUTPUT | *26*
11
Fig. 3
SET TOP BOX

CABLE
TELEVISION ── | CHANNEL | *18*   *15*
PROVIDER *10* | SELECTOR | ──────────── → TO TV

                              20   *22*
                 | MONITORING | | MEMORY | *16*
                 | CIRCUIT |

30
| RADIO | ← | RADIO MODEM OUTPUT | *28*
| MODEM |

Fig. 4
SET TOP BOX

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10

Fig. 11

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :H04N 7/00
US CL : 348/1, 2, 5.5; 455/2;
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 348/1, 2, 5.5; 455/2;

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search term used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,734,720 A (SALGANICOFF) 31 MARCH 1998; Abstract; Fig. 8, Fig. 9; col. 11, lines 31-55; col. 14, lines 12-35; col. 15, lines 55-65; col. 22, lines 44-68; col. 24, lines 61-67; col. 26, lines 8-36; col. 29, lines 15-35; col. 40, lines 37-57; col. 44, lines 49-67	1-27
Y		28-30
Y	US 5,528,582 A (BODEEP, et al) 18 JUNE 1996; col. 1, lines 38-55; col. 4, lines 21-36; Fig. 2	28-30
Y	US 5,410,344 A (GRAVES, et al) 25 APRIL 1995; Abstract; Fig. 2; Fig. 3; col. 2, lines 22-40	1-27

☐ Further documents are listed in the continuation of Box C.   ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance		
"E"	earlier document published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed	"&"	document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 DECEMBER 1999	**09 FEB 2000**

Name and mailing address of the ISA/US	Authorized officer
Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	REUBEN BROWN *James R. Matthews*
Facsimile No. (703) 305-3230	Telephone No. (703) 305-2399

Form PCT/ISA/210 (second sheet)(July 1992)*